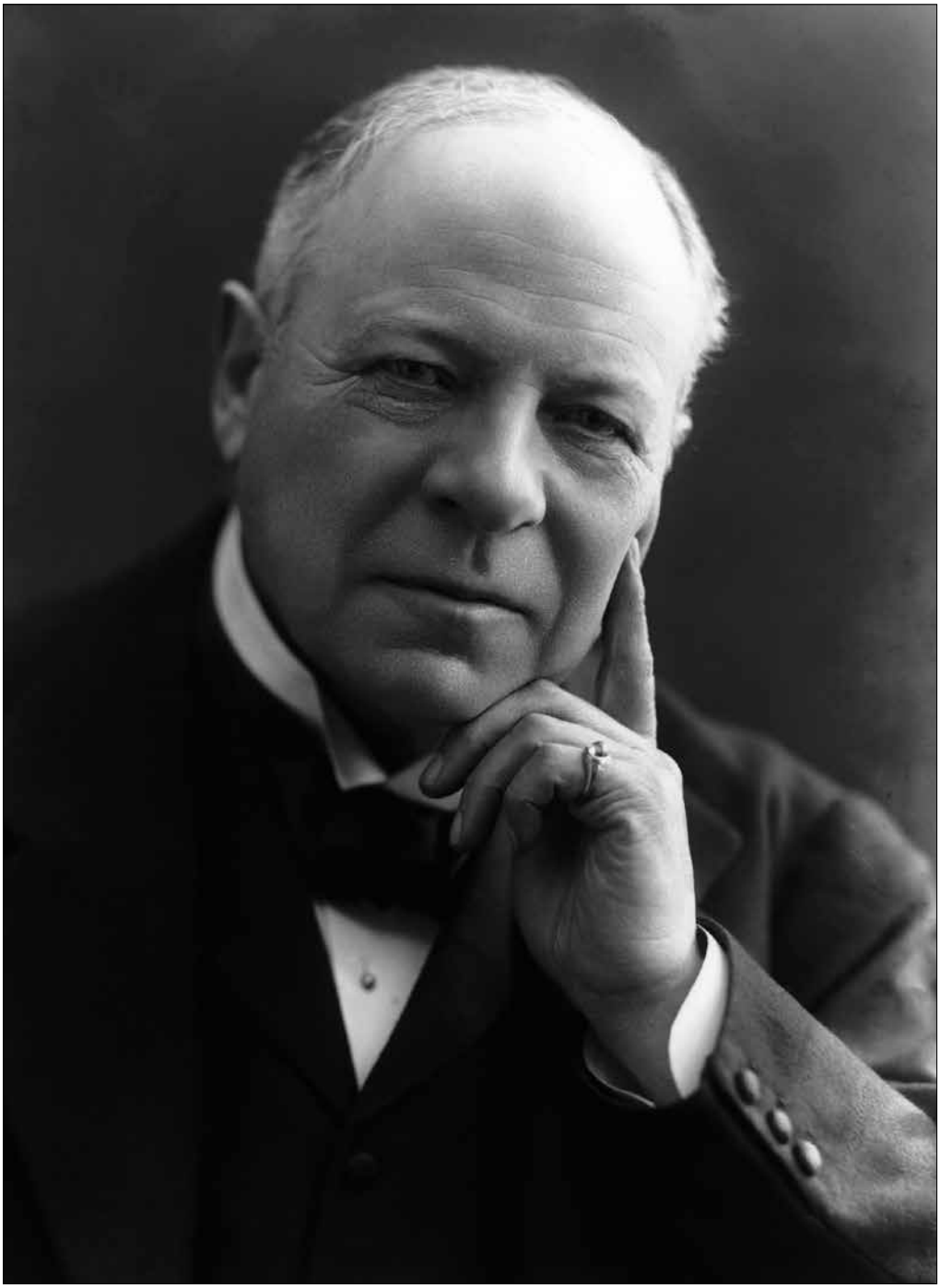
Birth of British Military Aviation



Richard Burdon Haldane, Viscount Haldane
Artist (Bassano), credited: © National Portrait Gallery, London

Naval and Military Aeronautics

HC Deb 02 August 1909 vol 8 cc1564-617

Motion made, and Question proposed, "That a sum not exceeding £36,464, including a supplementary sum of £6,500,. be granted to His Majesty to complete the sum necessary to defray the charge which will come in course of payment during the year ending on the 1st day of March, 1910, for sundry grants in aid of scientific investigation, etc., and other grants."

The SECRETARY of STATE for WAR (Mr. Haldane)

The Vote is a civil one, but it touches the Departments of the Navy and the War Office, and it is impossible to segregate the scientific elements in the Vote. In the discussion of the Vote, therefore, a little latitude should be allowed so that we may travel over the general field. This is the more necessary because the subject is such a new one. The Committee will be interested to know what progress has been made in aeronautics as applied to war purposes, and the answer must be from the very nature of the subject—not very much. There has been certain progress, and it will be found to be more substantial than it appears at first sight. I do not believe that so far that department of the subject with which this House is primarily concerned—the service of defence—any very rapid progress is being made all over the world. Great strides are being made, in the preparation of machines, but it is not enough to make machines that will fly, whether dirigibles or aeroplanes. They must be machines which can be made available for the purposes of war, and the difficulties which surround us are still so great that progress can only be made after exact and careful study and by the adaptation of inventions as they are brought forward to the peculiar conditions which must be fulfilled if effectiveness in war is to be secured. I only remind the Committee that, in war there is very little use for anything unless it can be applied with some certainty, that it would do what we want it to do, and unless you have some exactness in results. Now that stage has not been reached, and that has an important bearing on what I am going to say. The Prime Minister and the First Lord of the Admiralty some time ago asked me to take in hand the general consideration of the principles which underly this Vote and the devising of the machinery which should be called into existence, and after some study I made up my mind that there could be no real progress unless we proceeded scientifically and in order; that is to say, unless we were perfectly clear about what we wanted and as to the structure of the machines which were to be used to fulfil the purposes in view and the production of them in a way which would be at least effective. But I know that that is a very slow process. It is very damping to some ardent spirits, and yet I am sure that in the long run it is the best way of going. Accordingly, the first thing we did was to ask the Committee of Imperial Defence to investigate the subject, and to discuss it with the technical sub-Committee, which could take evidence and go into matters. That the Committee did, and they proceeded rapidly. We had the Report in a comparatively short time. The Report was to the effect that the class of machines must be divided into three heads—rigid dirigibles, non-rigid dirigibles, and aeroplanes. These belong to different spheres. For Naval purposes the rigid dirigible

is probably the only instrument of the kind that is of real value—at any rate, in the present state of knowledge. It may be quite different in twenty years, or even ten years' time, but I am talking of present conditions. For the Army the rigid dirigible has certain disadvantages. It is more difficult to turn, bring back, and bring to rest. It is more difficult in the Army than the Navy, and, therefore, in this matter we can only proceed tentatively, and it seems that the non-rigid dirigible is best for Army purposes. The aeroplane may become available for the Army, but at present there are certain defects. It will have to rise much higher before it can be safe for reconnoitring, and great strides will have to be made in the control of its flight. The remarkable events of the last few days—M. Blériot crossing the Channel, and other things that have been accomplished in the United States, and elsewhere—all point to this, that at some time hereafter the aeroplane will be an instrument which will be capable of effecting in all probability great results. But that is not so at the present moment, and even if the British Army had 200 aeroplanes of the best present construction we should not be one bit further on than we are at the present moment.

That being so, obviously there is a great deal of scientific investigation to do. We distribute that work by assigning to the Navy the investigation and, in a tentative way, the construction of the rigid dirigible. To the Army has been assigned the work of experimenting with non-dirigible machines of varying type, and also with aeroplanes. But the Committee of Defence reported that the non-dirigible was a long way further on, and much nearer being of use than the aeroplane at present, and, therefore, we set ourselves under the obligation to give our first attention to the non-rigid dirigible. But, in order to work these things out, it was necessary to get a great deal of knowledge. From what I have said it will be obvious that you cannot go fast in this matter. You must feel your way and make experiments. Another thing which is obvious is that what is being done in other parts of the world includes to a large extent in this class of work investigations which are available for everybody. Flying machines, whatever forms they take, are very simple machines, and you cannot keep secret very long any advance that has been made in their construction. Moreover, private inventors have been largely at work, and I doubt whether any machine which the Government possess would retain its secret for more than a very limited time. Therefore, I cannot say that I feel much concerned over what is a fact, that in this country we have not made the amount of initial progress that has been made in Germany, France and, perhaps, in the-United States. But I reflect that much the same thing was true of submarines. To-day, by our scientific procedure and by the work that has been done in the Admiralty, we stand, it is no exaggeration to say, at the head of the world as regards submarines. Then again, in motor cars also we were behind. I am no expert in motor cars, but I know enough to have a strong impression that if we are not up to the best Continental countries in every way, we are getting very near it in the construction of motor cars. Therefore, being more or less responsible for this matter, I felt myself able to advise my right hon. Friends that science should come first. I did not mean by that that we should not construct or experiment, but it did seem to be vital that the mass of scattered information that had been accumulated should be investigated in its scientific order.

For that purpose the Department constituted the Advisory Committee under Lord Rayleigh's presidency, on which the House knows it is not too much to say we have got some of the finest scientific training in the world. That Committee has held various meetings since it was appointed, and, of course, continuous work will be going on under its direction in the National Physical Laboratory. Meetings have been held there, and also at Aldershot and in the War Office, and in a moment I will tell the House some things on which the Committee has agreed. The Committee is not intended to construct. It is appointed to advise. It is not even charged with the duty of investigation, but its purpose is to scrutinise investigations which are submitted to it in the course of the work of the Departments concerned; and it has also had to conduct systematic experiments and has had to be furnished with the proper apparatus for that purpose. I hope in a few days that the first Report of the Committee and its work—of course, it is only in a tentative state—will be made public; but I may tell the Committee, meantime, the general character of what has been done. One very important thing was, we should make systematic arrangements under this Committee for getting the fullest knowledge of what was going on in aerostatics all over the world. The Reports, some of them very technical and in different languages, had to be digested and collated, and observations had to be kept of what is going on in scientific periodicals and the publications of the Departments of State of the various Governments; all that is being done. The work of anybody dealing with this subject of aerostatics is becoming more and more scientific in character. I went over not long ago to my old University at Gottingen, and I found there a chair which has been founded by the German Government, of which the standard of technical knowledge was so high that no student was admitted to the lectures who was not capable of devoting his whole attention to aerostatics. That is a rather heavy demand, but one cannot keep abreast of these things unless one has a very high theoretic knowledge as well as practical experience. The two must work together; and the Committee that has such men as Lord Rayleigh and Dr. Glazebrook upon it, and such men on the practical side as Mr. Lanchester and Mr. Mallock, and others, like Professor Petavel and Mr. Shaw, and also such high authorities on the Army and Navy side as Major-General Hadden and Admiral Bacon, is a Committee which is well furnished from the various points of view.

Accordingly this Committee has been at work, and the first thing they have done is to determine the general questions which should be studied. There have been memoranda by the experts on stability, screw propellers, wind structures, petrol motors, light alloys, and a very difficult thing which has arisen in connection with balloons, the accumulation of electro static charges on balloons. Everybody knows what a peril electricity is in the air. And the Committee have mapped out the general field of their work. There are certain very general questions in aerodynamics which are very technical, and with which I need not trouble the House, questions specially relating to aeroplanes, such as the mathematical investigation of stability, the effect of sudden action of gusts of wind, and half a dozen other things which are the subject of particular experiments. Then there are questions relating to these motors, which have to be of special construction for air work, and there are questions relating to airships and meteorology; because when you get up into the air you do not go up into a body

which behaves uniformly, but into an infinite variety of gusts and disturbances which makes it necessary that you should be prepared for a great deal that you do not think about when you are in safety on the earth below. That is the class of work which the Committee is doing. They have been furnished with a considerable scientific equipment already. There is a wind channel, and there is a whirling table; there are wind towers for experiments in the open; and there are other apparatus of a special character. Then the National Physical Laboratory already have a tank under construction for experimenting in ships' models, and that has been further adapted for this kind of work, and for which it will be very useful. The Committee has wisely entered into communication with the Aeronautical Society and the Aero League. The design of the Committee is to afford assistance to private inventors wherever this can be properly done, because we feel that progress will be not only a Government but a national matter. We hope that there will be close and friendly communications preserved throughout between the Government Advisory Committee and those bodies, to which it will render all the assistance in its power. One other matter I will mention. The private inventor is always a great anxiety. If he sends in his invention before he has taken out a patent he will be sure afterwards to say that you have helped yourselves to his idea. Moreover, it is not always clear that you have not done so, because it is impossible to learn a thing of this kind and then exclude it altogether from your brain. Consequently we are asking private inventors to cover their inventions by patent before they come to us, so that we may not incur undue odium. I told the Committee what the Advisory Committee is doing—the class of its work. Of course, it is in very close relation both with the Admiralty and the War Office. The Admiralty is concentrating, under Admiral Bacon—whose record in connection with submarines and deep diving and other highly successful enterprises I need not dwell on—on the building of a rigid dirigible of the very largest kind, at least the size of the Zeppelin. That is being built at Barrow-in-Furness by Messrs. Vickers. It is an engineer's business, and Messrs. Vickers, who are eminently qualified for this purpose, are working out construction in this matter together with the Admiralty. I hope the combination of experts and practical men may give us a practical result some time next spring. Anyhow, it will be a very large dirigible.

I pass to what the War Office is doing. The War Office, to begin with, is reorganising its factory at Aldershot. We are separating the instruction which is at present given to balloonists from construction, and we are at present preparing for construction of a very large shed to take in the very largest size of a dirigible. We have also ordered a gas-bag for balloons of considerable size, which I trust will serve some better purpose than that of merely advertising the existence of the balloon. Anyhow, that is coming from a firm abroad, who have had the special construction of these things, which we desire to possess, and we have a car and an engine which will be used for this particular dirigible. Then a very patriotic enterprise has been undertaken by two bodies, a Parliamentary Committee of this House and the "Morning Post." The "Morning Post" has collected a large sum, and proposes to present the War Office with a non-rigid dirigible. Then the Parliamentary Committee offered to put up a shed.

…

Discussion abridged

…

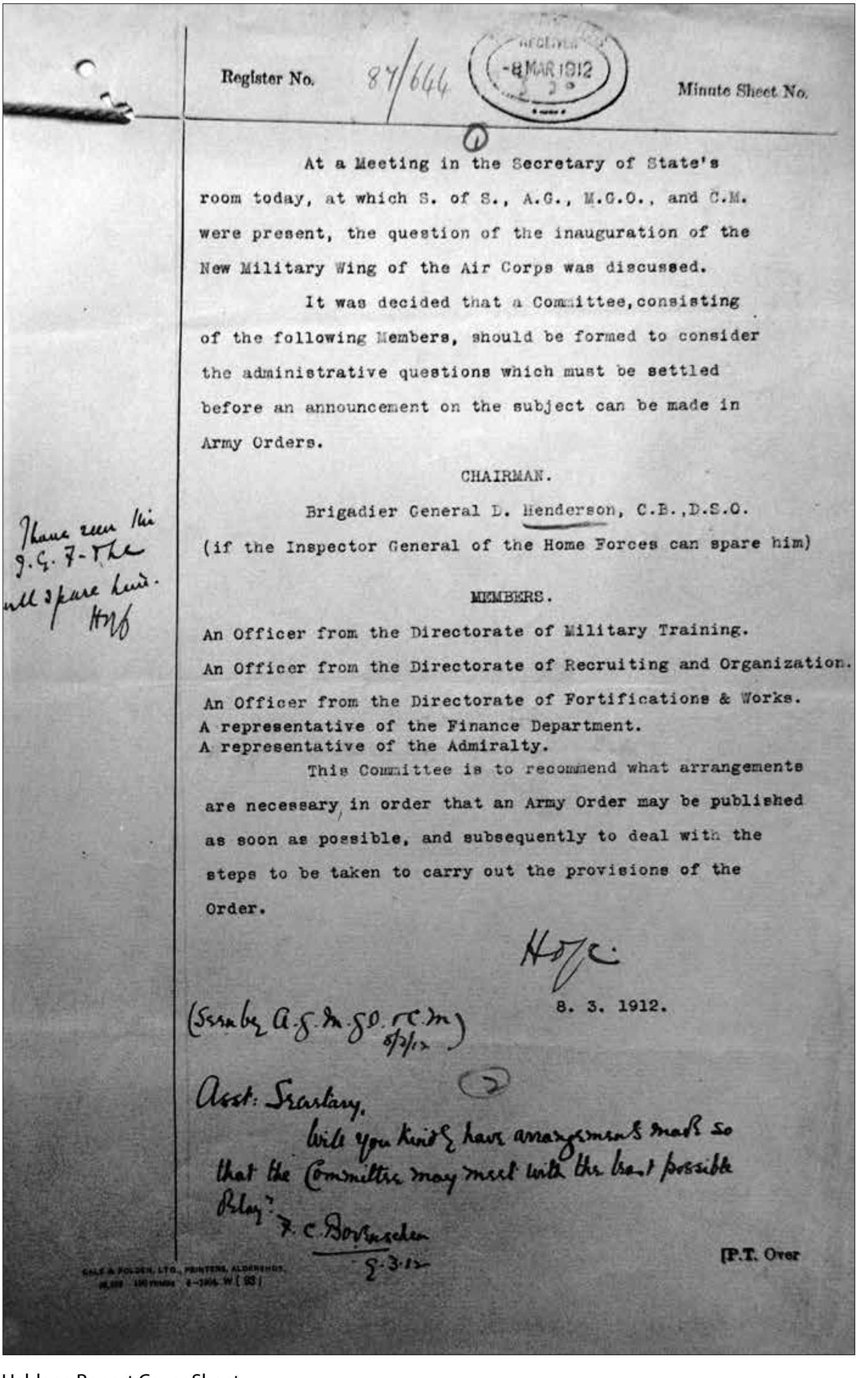
Mr. HALDANE

The Committee who are making special investigation into the question have relegated aeroplanes for the practical purposes of war to a much inferior position to that at present occupied by the dirigible airships, whether rigid or unrigid. The War Office and the Committee who have charge of the aeroplane question are not losing sight of the matter; on the contrary, as I have said before, through the instrumentality of two gentlemen, very distinguished in the aeroplane world, we are to be put in possession of two machines in a very short time. They will be lent to us for experimental purposes, and we propose to work them. If we find that progress is made with them we shall acquire them, or others. We are not overlooking the matter. But the aeroplane will have to fly much higher and with much greater security before it can be used for war purposes. It is in a very different position in that respect from the dirigible balloon.

Vote agreed to.

http://hansard.millbanksystems.com/commons/1909/aug/02/naval-and-military-aeronautics#S5CV0008P0_19090802_HOC_127

accessed 23 Jan 2013



Register No. 87/664 RECEIVED -8 MAR 1912 Minute Sheet No.

(1)

At a Meeting in the Secretary of State's room today, at which S. of S., A.G., M.G.O., and C.M. were present, the question of the inauguration of the New Military Wing of the Air Corps was discussed.

It was decided that a Committee, consisting of the following Members, should be formed to consider the administrative questions which must be settled before an announcement on the subject can be made in Army Orders.

CHAIRMAN.

Brigadier General D. Henderson, C.B., D.S.O.
(if the Inspector General of the Home Forces can spare him)

I have seen the I.G.F. — He will spare him. HofC

MEMBERS.

An Officer from the Directorate of Military Training.
An Officer from the Directorate of Recruiting and Organization.
An Officer from the Directorate of Fortifications & Works.
A representative of the Finance Department.
A representative of the Admiralty.

This Committee is to recommend what arrangements are necessary, in order that an Army Order may be published as soon as possible, and subsequently to deal with the steps to be taken to carry out the provisions of the Order.

HofC

8. 3. 1912.

(Seen by A.G. M.G.O. C.M. 8/3/12)

(2)

Asst: Secretary,
Will you kindly have arrangements made so that the Committee may meet with the least possible delay.
F. C. Borrowsden
8.3.12

[P.T. Over

GALE & POLDEN, LTD., PRINTERS, ALDERSHOT.

Haldane Report Cover Sheet

WAR OFFICE

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Printed for the Commitee of Imperial Defence. March 1912.

SECRET*

139-B

REPORT

OF THE

STANDING SUB-COMMITTEE

OF THE

COMMITTEE OF IMPERIAL DEFENCE

ON

AERIAL NAVIGATION

2, Whitehall Gardens, SW
February 29, 1912

* Editor's note: The original protective marking is reproduced for completeness although this document is now UNCLASSIFIED.

TERMS OF REFERENCE

THE Prime Minister desires that the standing Sub-Committee of the Committee of Imperial Defence, composed for the purposes of this enquiry of the following Members:

Lord Haldane *(in the Chair)*,
The Right Hon W S Churchill, MP
Colonel The Right Hon J E B Seely, MP, Parliamentary Under-Secretary of State for War,
Lord Esher,
Sir R Chalmers, Permanent Secretary to the Treasury,
Vice-Admiral H S H Prince Louis of Battenberg, Second Sea Lord of the Admiralty,
Lieutenant C R Samson RN†,
Major-General Sir C F Hadden, Master-General of the Ordnance,
Major-General Sir A J Murray, Director of Military Training,
Brigadier-General D Henderson, General Staff,
M O'Gorman, Esq‡,

Rear-Admiral Sir C I Ottley *(Secretary)*,

shall meet to consider:

(1) The future developments of Aerial Navigation for naval and military purposes.

(2) The measures which might be taken to secure to this country an efficient Aerial Service in war both as regards matériel and personnel.

(3) Whether steps should be taken to form a corps of aviators for naval and military purposes, or otherwise to co-ordinate the study of aviation in the Navy and Army.

2, Whitehall Gardens, SW
November 18, 1911

† Since promoted Commander.
‡ Added to the Sub-Committee at a later date.

SECRET

REPORT

THE Standing Sub-Committee of the Committee of Imperial Defence approve the attached Report by the Technical Sub-Committee, subject to the condition that the rates of pay (Part VII of the Report) and all financial considerations should be reserved for adjustment between the Departments concerned and the Treasury.

(Signed) HALDANE OF CLOAN (*Chairman*).
WINSTON S CHURCHILL.
J E B SEELY.
ESHER.
ROBERT CHALMERS.
LOUIS BATTENBERG.
C R SAMSON, Commander, RN.
C F HADDON.
A J MURRAY.
DAVID HENDERSON.
MERVYN O'GORMAN.

CHARLES L OTTLEY (*Secretary*).

2, Whitehall Gardens, SW
February 28, 1912.

REPORT

BY THE

TECHNICAL SUB-COMMITTEE

TABLE OF CONTENTS

SECRET

Report by the Technical Sub-Committee

INTRODUCTORY REMARKS

AT a meeting held on the 18th December, 1911, the Standing Sub-Committee of the Committee of Imperial Defence, which is enquiring into the future development of Aerial Navigation for naval and military purposes, agreed provisionally and tentatively to recommend certain broad principles regarding the future policy of the nation on this question (CID Paper AN 5). They concluded by delegating to a Technical Sub-Committee the task of elaborating all the details necessary to give immediate effect to the policy proposed, the actual terms of reference being as follows:

(a) The establishment of the Naval Aviation Service (Naval Wing of the Flying Corps) .

(b) The establishment of the Military Aviation Service (Military Wing of the Flying Corps) ‡.

(c) The establishment of the National Corps of Aviators (Flying Corps) ‡.

(d) The staff and establishment of the State School of Aviation (Central Flying School) ‡.

(e) The arrangements proposed for housing the staff and personnel of the State School of Aviation (Central Flying School) ‡.

(f) The provision of aeroplanes for the Navy, the Army, the National Corps of Aviators (Flying Corps) ‡, and the State School of Aviation (Central Flying School) ‡.

(g) The provision of hangars (sheds) ‡ for the above.

2. The Chairman of the Standing Sub-Committee subsequently directed the Technical Sub-Committee to consider in addition the following question:

(h) The use of dirigible balloons, captive balloons, free balloons, and kites in war, and the future organisation of the units devoted to any of these services.

3. In dealing with the questions referred to them the Technical Sub-Committee have endeavoured to adhere as closely as possible to the general principles provisionally adopted by the Standing Sub-Committee. The very detailed examination of each question which has been undertaken has, however, inevitably entailed in some cases modifications of these principles, and in others a clearer articulation of the policy proposed. Before setting forth their detailed recommendations regarding the several questions referred to them the Technical Sub-Committee consider it desirable to state clearly the general principles on which they have acted, and the general lines of the scheme adopted.

‡ The Technical Sub-Committee have adopted the nomenclature given in brackets [342].

PART I

CONSIDERATIONS OF GENERAL POLICY

Strategical Considerations

4. The Sub-Committee have been impressed by the evidence which has been placed before them regarding the backward state of Aerial Navigation in this country, when contrasted with the progress made by other great naval and military Powers. To illustrate this, it is sufficient to mention that France already possesses about 250 efficient military aeroplanes, and 150 qualified military and 80 civilian flying men, in addition to several airships; Germany possesses 20 or 30 military aeroplanes, and there are in addition from 100 to 120 aeroplanes belonging to civilians in that country; there are besides some 20 airships in Germany; Italy possesses about 22 military aeroplanes; and these other countries are engaged in considerable developments of their aeronautical services. In contrast to this, Great Britain possesses less than a dozen efficient aeroplanes, and only two small airships, to meet the combined requirements of the naval and military services in time of war.

5. It cannot be maintained, however, that the necessity for an efficient aeronautical service in this country is less urgent than in the case of the other great naval and military Powers. The efficiency of the aeroplane for purposes of military reconnaissance has been proved both in foreign manoeuvres and in actual warfare in Tripoli, and the Sub-Committee have no hesitation in recording their opinion that aeroplanes have now become an important adjunct to the equipment of an army in the field.

6. The strategical and tactical uses of the aeroplane as an adjunct to the operations of a fleet cannot yet be forecasted with equal certainty, as the question depends largely upon the solution of the technical difficulties in rising from and alighting on a ship and in rising from and alighting on the water. It is clear, however, that the Royal Navy cannot afford to incur the risk of dropping behind other nations in this matter, and that every facility must be given for experiment and progress.

7. Apart from the purely naval and purely military uses of aeroplanes, however, there remains the question of their employment for coastal defence, viz, for use over water while operating from a base on land. For example, aeroplanes are expected to prove of the utmost value in connection with the operations of destroyers and submarine-boats employed on coastal defence, while for reconnaissance purposes over the sea their usefulness has already been demonstrated.

8. Whatever may have been the advantages of a policy of postponing the development of aeroplanes for naval and military purposes, and of leaving the pioneer work to private enterprise and to foreign nations, it is clear that no further delay can be permitted without the risk of placing our naval and military forces at a grave disadvantage in time of war. Now that aeroplanes have to a great extent passed out of the experimental stage, as regards their employment in warfare, an active and progressive policy has become imperatively urgent.

9. The Sub-Committee recommend therefore that, on grounds of naval and military policy, no time should be lost in giving effect to their proposals.

General Principles

10. In formulating the policy set forth in this Report the Sub-Committee have endeavoured to comply with the following principles:

(a) The organisation adopted should provide establishments adequate for our present requirements, but must be sufficiently elastic to permit of considerable expansion in the future.

(b) The organisation should be capable of absorbing and utilising the whole of the aeronautical resources of the country.

(c) While it is admitted that the needs of the Navy and Army differ, and that each requires technical development peculiar to sea and land warfare respectively, the foundation of the requirements of each service is identical, viz, an adequate number of efficient flying men. Hence, though each service requires an establishment suitable to its own special needs, the aerial branch of one service should be regarded as a reserve to the aerial branch of the other. Thus in a purely naval war the whole of the Flying Corps should be available for the Navy, and in a purely land war the whole corps should be available for the Army.

(d) It is important to give every possible encouragement to the development of private enterprise in aviation, and every inducement should be offered to flying men who do not belong to the Navy and Army to join the Flying Corps. Proposals in this respect, and with regard to encouragement for existing aerodromes, will be found in this report.

(e) It is essential that all combatant officers in the Flying Corps should be practical flying men.

(f) Experimental work in all branches of the Flying Corps should be co-ordinated.

General Outline of the Policy Recommended

11. The general outline of the scheme recommended by the Sub-Committee is as follows:

12. The British aeronautical service should be regarded as one, and should be designated "The Flying Corps".

The Flying Corps should supply the necessary personnel for a Naval and a Military Wing, to be maintained at the expense of, and to be administered by, the Admiralty and the War Office respectively. The corps should also provide the necessary personnel for a Central Flying School, and a reserve on as large a scale as may be found possible.

13. In order to arrive at any definite conclusions as to the strength and organisation required for the Flying Corps, and more especially for the Central Flying School, the Sub-Committee have found it necessary to work out in detail establishments for the Naval and Military Wings. Their conclusions are based on these calculations.

14. A Central School should be established for the training of flying men on Salisbury Plain, to be maintained at the joint expense of the Admiralty and War Office, and to be administered by the War Office. After graduating at the Flying School, flying men should become members of the Flying Corps, and should then be detailed to join either the Naval Flying School at Eastchurch for a special course of naval aviation, or one of the Military Aeroplane Squadrons for a special course of military aviation, or to pass into the Reserve of the Flying Corps.

15. The Naval Wing of the Flying Corps, entry to which should ultimately only be obtainable by qualifying at the Central Flying School, should for the present have its headquarters at the Naval Flying School at Eastchurch. It is impossible to forecast what its ultimate organisation and development will be, as this depends to a great extent upon the result of experiments, which are about to be commenced, with hydro-aeroplanes.

16. The Military Wing of the Flying Corps should consist at first of eight squadrons**, entry to which should ultimately be confined to those who have qualified at the Central Flying School. The whole of these squadrons are required for use in connection with the Expeditionary Force. Expansion of the Military Wing will be necessary.

17. It is desirable that at present no establishment should be fixed for the Flying Corps as a whole, but only for the Naval and Military Wings, and these provisionally with a view to future expansion. The Flying Corps will be largely composed of officers and men who are not performing continuous service, and who are merely incurring an obligation and receiving a retaining fee on condition they keep themselves proficient. Many of them will probably be naval and military officers performing duty with their ships or regiments, and many others will have joined on conditions of service resembling those of the Special Reserve of the Army.

18. The mechanical requirements of the Flying Corps should be provided by the existing Army Aircraft Factory, to be renamed the Aircraft Factory. This establishment should undertake the following important duties: The higher training of mechanics for the Flying Corps and for the Central Flying School; the reconstruction of aeroplanes; repair work for the Flying Corps; tests with British and foreign engines and aeroplanes of the latest design; and experimental work.

19. The Aeronautical Advisory Committee should continue its experimental and research work on the present lines. The Sub-Committee desire to lay stress on the importance of the closest possible collaboration between the Naval and Military Wings, the Central Flying School, the Aircraft Factory, and the Advisory Committee. They recommend that an officer from the Central Flying School and an officer from the Naval and Military Wings respectively should be added to the Advisory Committee.

20. The Sub-Committee attach importance to the maintenance of private enterprise in the field of aeronautics in this country. The objects of this are not only to provide a reserve of flying

** Seven of these will be aeroplane squadrons, the eighth consisting of airships and kites.

men which may be drawn on in emergency, to stimulate invention, and to keep alive public interest, but also to provide aerodromes, landing places, and sheds at convenient intervals throughout the country, without which cross-country flights are almost impossible The French Government rightly attach immense importance to cross-country flights, and offer every possible encouragement to those engaged in military aviation to undertake such flights. The Sub-Committee have received information to the effect that the majority of the private aerodromes will soon be in financial difficulties. They have included recommendations which, while contributing directly to the efficiency of the service, will, it is hoped, assist those private enterprises. These recommendations are (a) that for the present naval and military officers and all civilians, who are candidates for commissions in the Flying Corps, should first have to obtain their Royal Aero Club Certificate (in return for which officers should receive a remuneration of £75); and (b) that a small rent should be paid to the principal aerodromes for landing rights and for the use of sheds by members of the Flying Corps engaged in cross-country flights.

21. The Sub-Committee recommended that a permanent consultative Committee should be appointed, to which questions in connection with flying affecting both Departments should be referred by the Admiralty and War Office. They further recommend that this Committee should be designated the "Air Committee" and should be a permanent Sub-Committee of the Committee of Imperial Defence, occupying a position analogous to that of the Overseas Defence Committee and the Home Ports Defence Committee. The suggested composition of the Air Committee is as follows:

The Parliamentary Under-Secretary of State for War (*Chairman*).

The Commandant of the Central Flying School.

The Officer Commanding the Naval Wing of the Flying Corps.

The Commandant of the Military Wing of the Flying Corps.

The Director of the Operations Division, War Staff, Admiralty.

The Director of Military Training, General Staff, War Office.

The Director of Fortifications and Works, War Office.

The Superintendent of the Aircraft Factory.

: { A member of the Secretariat of the Committee of Imperial

Joint Secretaries: { Defence.

{ An officer of the Naval Flying School.

22. Such, then, are the main outlines of the scheme submitted by the Sub-Committee for the future development of flying for naval and military purposes in this country. Their detailed recommendations under each head are set forth below. In addition to the matter already referred to in general terms this report deals with various subsidiary details, such as the future of naval and military airships, balloons and kites, the meteorological investigation of the upper atmosphere, and the pay of the Flying Corps.

PART II

THE FLYING CORPS

Functions

23. In their recommendations for the formation of the Flying Corps with its reserve, the Sub-Committee have found some difficulty owing to the consideration that the requirements of wastage in war in this new arm are entirely unknown quantities. The estimates which have been made of first-line requirements in this Report are therefore to some extent guess work. Hence it follows that the Reserve of the Flying Corps must be as large as financial considerations will permit, and must be capable of expansion in case of emergency – capable, indeed, of absorbing the whole of the resources of the country in this branch of science.

24. In connection with the proposed enrolment of civilians, the Sub-Committee have had the advantage of the advice of the following gentlemen prominently connected with aeronautics, viz: Mr H E Perrin, Secretary to the Royal Aero Club; Mr James Valentine; Mr Alex Ogilvie; Mr F K McClean; and Captain Bertram Dickson.

Conditions of Service

25. Entry to the Flying Corps as officers should ultimately be confined to those who have graduated at the Central Flying School. Those officers should be drawn from (a) officers of all branches of the naval and military forces, and (b) civilians. The rank and file should consist of warrant officers, petty officers, non-commissioned officers and men transferred from the Royal Navy or the Army, and also of men enlisted directly into the Flying Corps, either on a regular or a special reserve basis.

26. Officers of the Navy or Army who desire to join the Flying Corps should make application through the ordinary official channels. If selected, they should, if not already in possession of the Royal Aero Club certificate, be instructed to obtain this certificate by private arrangement, and should be refunded the sum of £75 to meet the expense incurred. They should then be attached to the Central Flying School, and later, as may be necessary, to the Naval or Military Wing for further training. At the conclusion of this further period they should be eligible to be appointed either (a) for continuous service in the Naval or Military Wing of the Flying Corps, or (b) to the permanent staff of the Flying School, or (c) to the Flying Corps Reserve.

27. The period of appointment recommended in the case of officers, who elect for continuous service with the Naval or Military Wings of the Flying Corps or at the Central Flying School, should normally be four years, with such extension as may be approved. Should an officer be found unsuitable at any time he should be relieved of his appointment.

28. Civilian candidates who desire to join the Flying Corps as officers should forward their applications in the first instance to the Commandant of the Central Flying School, quoting the number of their Royal Aero Club certificate.

29. The conditions of service of officers and men who join the Naval or Military Wings of the Flying Corps for continuous service are dealt with separately in subsequent paragraphs. Men transferred from the Navy and Army, or enlisted from civilian sources, for continuous service should be selected by the naval or military authorities respectively, and by the Commandant of the Central Flying School. The period of enlistment recommended is four years, with re-engagement from year to year, or opportunity to transfer to the Reserve.

30. The Sub-Committee attach great importance to the primary condition that every member of the Flying Corps should incur a definite obligation to serve in time of war either for naval or military purposes in any part of the world.

31. The Flying Corps, with the exception of the Naval Wing and officers and men of the Royal Navy and Royal Marines who are members of the Reserve of the Flying Corps, should be under the administration of the War Office.

Conditions of Reserve Service

32. It seems desirable that the officers of the Reserve of the Flying Corps should be divided into two classes; the fliers of the first Reserve should be required, as a condition of receiving the retaining fee, to produce on the first day of each quarter satisfactory evidence that they have performed during the previous quarter flights amounting to an aggregate of nine hours in the air, and including the cross-country flight of not less than one hour's duration. These conditions should be subject to modification in particular cases. Fliers of the second Reserve should receive no retaining fee, and should not be required to carry out any flights, but should be available for service in the Flying Corps in time of war.

33. Fliers of the First Reserve should be given facilities for their obligatory flights every quarter at one of the naval or military establishments, or, if this is impossible, at a private aerodrome, all expenses being recoverable from the State in the latter case. An authorised rate of payment should be laid down for flights undertaken at private aerodromes. Fliers who have facilities for flying, such as those engaged professionally at the various private aerodromes, would, of course, have no difficulty in furnishing a certificate duly witnessed by some trustworthy person.

Emoluments

34. Recommendations regarding emoluments are contained in Part VII of this Report.

Aeroplanes

35. The question of the aeroplanes required for the Naval and Military Wings of the Flying Corps and for the Central Flying School is dealt with in Parts III, IV, and V of this Report. The Sub-Committee do not consider it desirable that any aeroplanes should be purchased for the Reserve of the Flying Corps at the present stage, though this should not prejudice future policy on this question. For the present the Reserve should provide personnel rather than matériel.

36. The Sub-Committee recognise, however, that a reserve of matériel would be required in war. They recommend, therefore, that the Commandant of the Central Flying School should keep a register of privately owned aeroplanes, which might usefully be purchased for the use of the Flying Corps in case of emergency.

37. They further recommend that members of the Flying Corps, who own aeroplanes, should be encouraged to bring these to the Central Flying School, when they undergo their training there, and to naval and military manoeuvres. Owners should be indemnified in the event of a serious accident to their machines, when so employed, or repairs should be effected at the cost of the State. They should, in addition, receive hire for their machines on a scale to be laid down.

38. The Commandant should be responsible that no privately owned machine is used at the Central Flying School which is not efficient and safe in every respect, and the Senior Flying Officer present should be similarly responsible on every other occasion. Officers should be given full discretion in this matter.

Remarks

39. The evidence taken by the Sub-Committee leads them to believe that the above inducements would be sufficient to attract a considerable proportion of the qualified flying men in this country, while the conditions are such as to ensure creation of a really valuable reserve, available in any part of the world, and for either service.

40. Apart from those flying men who are able to fly regularly, or who are employed on the staffs of private aerodromes, there are a number who have taken flying certificates, but have not the means or opportunity to undertake frequent flights. It is believed that these would welcome the opportunity provided for flying, as well as the retaining fee and the prospects of pay when called up for service.

41. It is not proposed at present to fix any limit to the numbers to be entered, as the number of qualified flying men in the country is comparatively small, and it is unlikely that as many as 100 applications will be received in the first year. Later on it will probably become necessary to fix a definite establishment of the Reserve of the Flying Corps.

PART III

THE CENTRAL FLYING SCHOOL

Situation

42. The Sub-Committee recommend that the Central Flying School should be established on Salisbury Plain, on ground south-east of Upavon, the contract for the purchase of which has been signed. This ground must be regarded essentially as a flying ground. It should only be used for the training of troops in so far as that training interferes in no way with the work of Central Flying School.

43. The Technical Sub-Committee paid a visit to this site, and are satisfied that it is entirely suited for the purposes of the Central Flying School in every respect.

44. The technical members of the Sub-Committee, who visited the site twice, in order to view it under varying conditions, reported as follows:

> "This area is in every way suitable for the proposed purpose. It is better than any British aviation ground with which the members of the Committee are acquainted".
>
> "A certain amount of ground is at present under plough, but there is nothing to prevent the formation of an excellent surface for rolling over very large tracts".

45. Apart from its excellence as a flying ground, however, the site selected presents the following advantages:

> (1) It is situated in a lonely spot several miles from a railway station, and is therefore not liable to the inconvenience and danger of attracting large crowds of spectators.
>
> (2) The nature of the surrounding country is such that good landing places are available over a very wide area.
>
> (3) A good road runs through the centre of the aerodrome affording all necessary transport facilities.
>
> (4) The presence of large numbers of troops undergoing training on Salisbury Plain offers facilities for preliminary training in military reconnaissance.
>
> (5) It is conveniently situated with regard to the existing aerodromes at Aldershot, &c, for the commencement of cross-country flights, and is not too far distant from the sea at Portsmouth and Portland.

Number and Length of Courses of Instruction

46. The Sub-Committee recommend that there should be three courses at the Central Flying School during the year, each course to last four months, which is considered to include a sufficient margin of time for leave of absence and spells of bad weather.

47. There appears to be no reason to suppose that one season of the year is less favourable than another for training in flying. It is possible that in summer there are more days during some part of which flying is possible. In winter, on the other hand, there are apt to be more days during the whole of which it is possible to fly.

48. The Commandant of the Central Flying School should be given discretionary power as to the standard to be obtained by individuals before graduation.

Syllabus of the Course of Instruction

49. The training to be carried out should include:

(i) Progressive instruction in the art of flying.

(ii) Instruction in the general principles of mechanics and the construction of engines and aeroplanes.

(iii) Instruction in meteorology.

(iv) Training in observation from the air.

(v) Instruction in navigation and flying by compass.

(vi) Training in cross-country flights.

(vii) Photography from aircraft.

(viii) Signalling by all methods.

(ix) Instruction in types of war-ships of all nations.

50. The naval and military flying establishments should undertake the more advanced training in observation and the transmission of intelligence.

51. The Sub-Committee recommend that the Staff for the Flying School should be selected as soon as possible, and should be formed into a Committee to draw up the syllabus for the first course of instruction for submission to the War Office.

Numbers to be Trained

52. It is estimated that the number of fliers required for the Navy is forty a-year.

53. To provide the war establishment for the seven Aeroplane Squadrons that are considered necessary for our Expeditionary Force, 182 Officer fliers and 182 non-commissioned Officer fliers are required. This will entail passing through the Central Flying School one quarter of this total number annually, if it is assumed that under present conditions a flier can hardly be expected to remain at active aeroplane work for more than four years.

54. If, in excess of actual Naval and Military requirements, a margin is allowed of, say, 25 per cent for pupils undergoing instruction who fail to obtain certificates of proficiency either through sustaining injuries or through loss of nerve, the total service requirements as regards the annual intake of pupils at the school is as follows:

One-quarter military war establishment of fliers:	91
Royal Navy, say:	40
	131
Add 25 per cent	33
Total:	164

55. In addition it appears desirable to allow for the entry of (say) fifteen civilians during the course of the year, or five for each course of instruction.

56. Hence the total number to be passed through the Central Flying School in each year will be:

To maintain the Naval and Military Establishments:	164
Civilians:	15
	179

57. Having regard to the foregoing considerations the Sub-Committee are of opinion that for the immediate future, accommodation should be provided for sixty pupils at the Central Flying School in each term. As these numbers are liable to be increased, when the requirements of the Army other than those of the Expeditionary Force are decided, the school should be readily capable of expansion.

Staff

58. The Sub-Committee recommend that the Staff of the Central Flying School should be as follows:

1 Commandant.
1 Secretary (Paymaster RN).
1 meteorological expert.
1 Medical Officer.
1 Quartermaster (military).
1 store keeper.

1 instructor – theory and construction.
1 engineer – for engines.
3 mechanists.
20 mechanics and labourers.

5 instructional flights, each:

1 officer instructor.
2 mechanics or petty officer fliers.
4 riggers (or carpenters).
4 fitters (or ERA).

Aeroplanes

59. The Sub-Committee have obtained sanction for the purchase of the following twenty-five aeroplanes for the Central Flying School, and deliveries will commence as from the 30th April, 1912:

"A" Flight –
5 Bristol 50 Gnome engine biplanes, to be transferred from the present Air Battalion.

"B" Flight –
2 twin F-type Short biplanes, with Gnome engines.
2 single F-type Short biplanes, with Gnome engines.
1 Short-Tractor biplane, with 70 hp Gnome engine.

"C" Flight –
2 Flanders, two-seater, monoplanes.
3 Roe, two-seater, biplanes.

"D" Flight –
1 Deperdussin, two-seater, 70 hp Gnome engine, monoplane.
1 Deperdussin school machine, 60 hp Anzani engine, monoplane.
3 80 hp Canton Unné Bréguet, biplanes.

"E" Flight –
2 Nieuport, 50 Gnome, two-seater monoplanes.
2 Blériot, 35 hp Anzani, single-seater, Monoplanes } Substituted for 3 Bristol monoplanes in the list previously approved.
1 Blériot, 50 hp Gnome, single-seater Monoplane }

60. The makers have been called upon to meet the following requirements:

(a) The maker to supply a stress diagram or skeleton drawing showing the calculated load on each strut and tie wire, when in flight with flier, passenger, and fuel for one hour.

(b) To invert machine, load wings with double to load taken in flying less the wing weight and tilt to an angle of 1 in 5.

(c) When loaded as in (b) it must be possible to cut any one wire without causing any detrimental effect.

(d) The landing chassis must be able to be driven round Laffan's Plain at 15 and 20 miles an hour without damage.

(e) A margin of engine power to be provided beyond that required for the normal flight speed. To be proved by a rate of rising of not less than 70 feet per minute vertical velocity while travelling at a speed of not less than about 38 miles an hour.

(f) One hour's continuous flight, finishing with a 500 feet *vol plané*.

(g) Duplicate control and double control mechanism in all cases except single-seaters.

(h) If required, for every machine built one representative of the Navy or Army must be taught to have complete control.

The estimated cost of the above aeroplanes is £21,000.

Balloons

61. Major Sir A Bannerman, Bart., Commandant of the Army Air Battalion, has pointed out in his evidence before the Sub-Committee, the value of cross-country flights in free balloons as a means of training aeroplane fliers in observation, map reading, and finding their way. Those members of the Sub-Committee who are fliers have pointed out that these arts are not easily taught in an aeroplane, as the attention of the flier, particularly while learning to fly, is engrossed in the management of his machine. The Sub-Committee recommend, therefore, that the course of instruction at the Central Flying School should include flights in free balloons, as long as these are available, but they do not propose that any new balloon should be constructed at present.

Buildings

62. It has been brought to the notice of the Sub-Committee that experience has shown that buildings of a permanent nature are very much more satisfactory, and ultimately more economical, than temporary buildings. Moreover, temporary huts are not well suited to the climatic conditions of Salisbury Plain.

63. Having regard, however, to the fact that the Central Flying School may require large expansion in the near future, and more especially that temporary buildings can be erected far more rapidly than permanent ones, the Sub-Committee recommend that all buildings, including sheds, should be of a temporary nature, without prejudice to the construction of more permanent buildings in the future.

64. In a second interim Report dated the 24th January, 1912, which has received the approval of the Prime Minister, the Sub-Committee have recommended that, in order to avoid delay in the establishment of the Central Flying School, sanction should be given by the Treasury for an immediate expenditure by the War Office for the erection of temporary barracks, sheds, workshops and a small hospital, at an estimated cost of approximately £25,000. All plans and specifications are now ready and tenders have been invited.

Transport

65. The Sub-Committee recommend that complete War Transport for two flights of aeroplanes should be provided at once for the Central Flying School. (See Schedule (B)).

Remarks

66. The Sub-Committee desire to lay stress on the importance of commencing operations at the Central Flying School at the earliest possible date, since the regular supply of trained fliers to both services, and the formation of a reserve depend upon this. It was this consideration which led them to submit two interim reports urging that the buildings should be taken in hand and the necessary aeroplanes purchased at once. They are informed that the buildings will be ready for occupation by the 30th June, 1912. The formation of the school should be proceeded with independently of the completion of the buildings by the use of canvas tents and sheds.

67. The Instructional Staff will require a few weeks in which to assemble, tune up, test, and accustom themselves to the new aeroplanes, but it may confidently be expected that the first course will be completed before the close of 1912.

PART IV

THE NAVAL WING OF THE FLYING CORPS

Provisional Organisation

68. The Naval Wing of the Flying Corps should be established for the present at the Naval Flying School at Eastchurch. For the immediate present its energies will be devoted mainly to elementary training in flying, so as to provide a nucleus of fliers for the first requirements of the Navy, pending the establishment of the Central Flying School, and to experimental work in the development of aeronautics for the Navy.

69. In a short time the elementary training in flying should be undertaken entirely by the Central Flying School, and the Naval Flying School should then be utilised for experimental work, and for the specialised training of naval ranks and ratings, and of selected civilians in naval air work.

70. It is impossible to over-estimate the importance of experiments for the development of hydro-aeroplanes, and in flying from and alighting on board ship, and in the water under varying weather conditions. Until such experiments have proved conclusively how far such operations are practicable it is impossible to forecast what the rôle of aeroplanes will be in naval warfare, or to elaborate any permanent organisation. The present organisation must therefore be regarded as provisional.

Personnel

71. The Sub-Committee recommend that the Naval Flying School at Eastchurch should, for administrative purposes only, be under the orders of the Captain of HMS "Actæon", and that all officers and men should be borne on the books of the "Actæon".

72. The Headquarters of the Naval Wing and the Staff of the School should, for the present, be as follows:

1 Commanding Officer, who will also act as Chief Experimental Officer.
6 Officers as Instructional and Experimental Officers. (Three of these are already acting, and the remainder are under training).
1 Engineer Lieutenant in charge of aeroplane engines and stores. (Now under training).
1 Medical Officer.
1 Carpenter Warrant Officer in charge of all repairs to machines, and as instructor to carpenter ratings. (Now under training).
1 carpenter rating as instructor. (Now under training).
7 carpenter ratings. (Three under training). } In charge of
1 engine-room artificer as instructor. } naval
5 engine-room artificers. (Three under training). } aeroplanes.
2 electricians. (One under training). }
4 privates RMLI as officers' servants (the two at present at Eastchurch to be instructed in aviation, as they have already some knowledge, and have spent eight months at Eastchurch).
1 officers' cook.
1 cook.
1 cook's mate.
4 pensioners as labourers for cleaning machines, sheds, &c, and for holding aeroplanes when being started.

This list should be subject to expansion as required.

Aeroplanes

73. The Standing Sub-Committee have already presented a short interim report (CID Paper AN10), dated the 6th January, 1912, which has received the approval of the Prime Minister, urging that, in order to avoid delay, Treasury sanction be given to the Admiralty to order certain aeroplanes. Although the list attached to that report is adhered to in the main, it has been modified in some minor details, the total cost being slightly reduced.

74. The final list of aeroplanes, hydro-aeroplanes, and floats recommended is as follows:

			£
(1)	Instructional and practice machines –		
	(a)	One twin engine biplane (now in use) from Messrs Short Bros	1,400
	(b)	One new twin-engine Short biplane from Messrs Short Bros	2,084
	(c)	One 70 hp Gnome single-engine biplane from Messrs Short Bros	1,184
	(d)	One Bréguet biplane from Bréguet Co, France, with Chenu engine	1,400
	(e)	One Nieuport 50 hp two-seater from Nieuport Co, France	1,040
	(f)	One Short monoplane from Messrs Short Bros	820
	(g)	Deperdussin monoplane, two-seater 70 hp, from Deperdussin Co, England	1,080
	(h)	One Etrich monoplane from Austria	1,500
		Floats for aeroplanes:	
		Six sets of floats, made by Messrs Short Bros. (Safety device for practice flying over water)	300

(2) Experimental and service machines –

(a)	Two hydro-aeroplane machines, one of the biplane and one of the monoplane type, with twin engines, to be ordered from Messrs Short Bros at once		4,500
(b)	Six hydro-aeroplanes to be tendered for at once by English firms, to fulfil the requirements as specified in Schedule I	}	
(c)	Six further hydro-aeroplanes to be ordered from the firms making the most satisfactory machines	}	20,000
Total			35,308

75. Tenders have been called for all the above except items 2(b) and (c). These two items were not included in the interim report, as their immediate supply was not considered to be a matter of such vital urgency as in the case of the aeroplanes. As experiments with hydro-aeroplanes are in their infancy and very few successful flights from water have been made at all, and these few only from still water, the Sub-Committee recommend that the purchase of the six hydro-aeroplanes referred to in Items 2, (b) and (c), should be conditional on successful experiments with the two hydro-aeroplanes referred to in Item 2(a).

76. As regards items (d), (e), (f), (g), and (h) in clause (1), it should be stipulated that these machines should be delivered at Eastchurch, assembled, and flown for at least one hour by their respective firms before acceptance is taken.

77. In approving these lists the Sub-Committee have been actuated by the consideration that it is desirable to test a number of types with a view to arriving at the most suitable pattern for naval service. They recommend, however, that, as soon as a satisfactory type of aeroplane for future use has been evolved, orders should be given so as to ensure that there are always not less than two machines of the same type available.

Sheds

78. The Sub-Committee desire to confirm the recommendation contained in the Interim Report of the Standing Sub-Committee, dated the 6th January, 1912 (CID Paper AN 10), that the following sheds should be provided forthwith for the Naval Flying School, viz:

		£
(1)	Six large sheds, 60′ + 70′ + 15′, built by Mr Wm Harbrow, South Bermondsey Station, London	2,800
(2)	Three large portable canvas sheds	1,000
	Total:	3,800

Two of the portable sheds have already been ordered.

79. Fixed sheds are preferred to portable ones at Eastchurch because the very exposed position of the aerodrome and the strength of the wind render the latter unsuitable and unsafe for permanent use. The three portable sheds are required for the use of aeroplanes employed for experimental work on the water off Burntwick Island, for emergency use in actual warfare, and for accustoming those under training to the sheds they would use on active service.

Buildings, Works and Land

80. The Sub-Committee recommend an expenditure of £7,250 on land, buildings, and works in connection with the Naval Flying School.

Negotiations for the purchase of the land required are in progress.

Maintenance

81. The Sub-Committee recommend that the following sums should be allotted for the general cost of maintenance of the Naval Flying School at Eastchurch during the financial year 1912-13:

	£
Instruments, compasses, thermographs, barographs, anemometers, meteorological tower, small balloon for carrying instruments, &c	700
Machinery for repair work	400
Aeroplane spares, such as aeroplane propellers, &c	500
Upkeep for twelve machines in constant use, petrol, oil and repairs	2,500
Subscription to Aero Club for use of aerodrome, annually	150
Travelling expenses, naval aviators visiting works, trials, &c	500
Purchase and upkeep of two motor cars (one of the shooting brake type)	1,250
A sum of money to be provided for encouragement of designers, constructors, and engine makers, and for purchase of accessories and improvements which are being continually put on the market	2,000
Total:	8,000

82. With regard to the last item, the Sub-Committee consider it advisable that the Admiralty should have funds at its disposal for experimental work. The results of all experiments should, however, be communicated to the Aeronautical Advisory Committee.

The Eastchurch Aerodrome

83. Representatives of the Sub-Committee visited the Eastchurch Aerodrome with a view to ascertaining the suitability of the site. They reported that this aerodrome is quite suitable for a Naval Flying School of moderate dimensions.

84. The ground is held by the Royal Aero Club on long lease, and the use of the aerodrome is granted to the Royal Navy on favourable terms by the Royal Aero Club. This is satisfactory as far as it goes. But if it be intended that the school should be permanently situated here, and that expenditure on permanent buildings should be undertaken, it would seem to be advisable for the Government to institute inquiries as to the possibility of securing the freehold of the ground, thus safeguarding any expenditure on improvements, and also making it possible to extend the ground if required. There appears to be a likelihood that the freehold of the aerodrome and of additional ground might be secured on favourable terms. The Sub-Committee recommend this suggestion for the consideration of the Admiralty.

Training Programme

85. The Sub-Committee recommend for the favourable consideration of the Admiralty the following programme prepared by the Officer Commanding the Naval Flying School:

(1) On the 1st March, 1912, four additional mechanics and four additional carpenter ratings should be sent to undergo training, and about this time more officers and some seamen ratings should be sent to be trained in aviation.

(2) Provision should be made for the training of certain ratings to be transferred to the staff of the Central Flying School

The Use of Airships for the Navy

86. The Sub-Committee have given careful consideration to the question as to whether it is desirable to continue the experiment of building naval airships, which ended with the collapse of Naval Airship No 1 before it had actually undertaken a single flight. They have had the advantage of hearing the evidence of Captain Murray F Sueter, RN, Inspecting Captain of Naval Airships.

87. The Naval Airship No 1 was built on the recommendation of a Sub-Committee of the Committee of Imperial Defence, which reported in January 1909, at a time when the Zeppelin airship appeared to be well on the road to success. The expectations which it was hoped to realise may be gathered from the following extract from their Report (CID Paper No 106 B):

"5. *The Type of Dirigible for Naval Warfare*. Reliability is the first essential in an airship intended for use over water. It should be capable of remaining away from its base for periods of several days at least – that is to say, leakage of gas must be reduced to a minimum. This condition is more easily secured in a rigid than in a non-rigid type, as in the former case a space for air can be left between the outer and inner envelopes, which will prevent the expansion and contraction of gas due to the variation of temperature. Another essential is great speed, in order to render the airship as far as possible independent of wind, and this involves engines of high power. Secure mooring appliances are also indispensable, and these, it is held, can be provided more easily with a rigid than with a non-rigid frame. In order to ensure efficiency it is essential that the crew should be numerous enough to allow for reliefs, and that a certain amount of comfort should be provided. Reliable navigational facilities are required, and in this respect the rigid type appears to offer advantages over the non-rigid, as an observer in the former should be able to mount to the top through a gap between adjacent gas-bags with a view to taking astronomical observations, whereas this is impossible with a non-rigid balloon, from the car of which the greater part of the heavens is obscured by the gas-bag.

"All these conditions – engine power, mooring appliances, accommodation for the crew, and navigational facilities – involve additional weight and consequent increased lifting power, and the expert evidence taken by the Committee tended to show that where great size is desired the rigid type is preferable.

* * * * *

"7. In this connection it is worthy of mention that there are grounds for supposing that the German Government intends to use the rigid Zeppelin air-ship for naval purposes. Nearly all the experiments have been made over water; it is housed in a floating shed; and German naval officers are stated to have been instructed in its use. On the other hand, the German dirigibles of the non-rigid type have hitherto been employed exclusively for military purposes.

"8. *The Use of Dirigibles in Naval Warfare*. The principal use to be made of dirigibles in naval warfare is for scouting. The attention of the Committee has been drawn to the fact that the visible horizon in clear weather from a balloon at a height of 1,000 feet is 40 miles distant, and at 2,200 feet 60 miles distant, as compared with 12 miles from the deck of a ship. It is obvious that an airship combining great speed with the power of ascending to these heights would possess great advantages in scouting over the vessels usually employed, and the cost should be very much lower.

"The cost of a dirigible suitable for naval purposes is estimated at £35,000 (including preliminary and incidental expenses), as compared with £80,000 for a destroyer and £400,000 for a 3rd class cruiser. It would appear also that, in the case of a fleet observing an enemy in port, or carrying out a blockade, the dirigible might be able to gain information which would be unobtainable by any other means. By scouting over a wide area round a fleet before nightfall a few dirigibles should, moreover, be able to give a long warning of intended torpedo-boat attack.

"9. In order to give the dirigible its maximum value as a naval scout, it is indispensable that communication by wireless telegraphy should be insured. The Committee is informed that no great difficulty is anticipated in securing this condition".

88. The Sub-Committee are of the opinion, however, that the prospects of the successful employment of the rigid type of airship are not sufficiently favourable to justify the great cost. They therefore recommend that the naval experiments should be confined to the development of aeroplanes and hydro-aeroplanes. The utmost vigilance should be taken, however, by the Admiralty in watching foreign developments of the airship, and the present recommendation should not be taken to prejudice a reopening of the question, should important developments occur.

PART V

THE MILITARY WING OF THE FLYING CORPS

General Principles of Organisation

89. In this section the Sub-Committee have not dealt with any military requirements beyond those of the Expeditionary Force, those requirements being of urgent importance. It must be borne in mind, however, that considerable extension will be necessary in order to provide for the requirements of those military forces which are not included in the Expeditionary Force.

90. The Sub-Committee recommend that for the future the Military Wing of the Flying Corps should comprise all branches of aeronautics, including aeroplanes, airships and kites. All these are required for the same purpose and should work in close co-operation.

91. The present Air Battalion, RE, ceases to exist under this scheme. Its personnel and matériel should be absorbed as far as required in the Flying Corps.

92. The purposes for which aeroplanes will be required in land warfare are as follows:

(a) Reconnaissance.

(b) Prevention of enemy's reconnaissance.

(c) Inter-communication.

(d) Observation of artillery fire.

(e) Infliction of damage on the enemy.

93. Having considered the organisation of the aeronautical forces of France and other Powers, so far as information is available, the Sub-Committee are of opinion that the Establishments laid down below will provide a suitable organisation for the Expeditionary Force of 6 divisions and 1 cavalry division, viz:

Headquarters.
7 Aeroplane Squadrons, each providing 12 aeroplanes.
1 Airship and Kite Squadron, providing 2 airships and 2 flights of kites.
1 L of C Flying Corps Workshop.

Administration

94. The Sub-Committee recommend that the administration of the Military Wing should be carried out by the War Office.

Fliers Required for Seven Aeroplane Squadrons

95. Up to the present time we have only attempted to train officers as fliers. It is now proposed to train non-commissioned officers and men as well.

96. It is considered that the minimum number of trained fliers should be 2 per aeroplane. Of these 1 should be an officer, and, in the case of one-seated machines, both should be officers.

97. For purposes of calculation, however, 1 officer and 1 non-commissioned officer flier are allowed.

98. The number of fliers required on this basis is shown in the table below:

	7 Squadrons	
	Officers	NCOs
Commanders	7	…
Sergeants	…	7
3 sections	84	84
Totals:	91	91

99. In addition, it is necessary to provide a reserve to meet casualties, and it is considered that this should be on a basis of 100 per cent for six months' wastage.

100. The total number of fliers required will therefore be:

	Officers	NCOs
For war establishment and 7 squadrons	91	91
Reserve	91	91
Totals:	182	182

War Establishment of an Aeroplane Squadron

101. In addition to fliers the necessary mechanics should be provided for the maintenance of machines, &c.

102. The complete war establishment of a squadron is shown in Schedule (A), attached.

Peace Establishments

103. The first requisite is to provide the trained personnel for the formation of the war establishment of the flying service.

104. Having regard to the anticipated heavy wastage in time of war, to the necessity of having more than one highly trained flier if full value is to be obtained from each aeroplane, and to the time which will be required before a reserve can be built up, the Sub-Committee recommend that the War Office should aim at maintaining a peace establishment of the fliers for the 7 squadrons equal to the war establishment.

105. Eventually it may be possible to draw up a more economical peace establishment, when the Reserve of the Flying Corps has been developed sufficiently to enable the Military Wing to count on an effective organised reserve.

Distribution of the Aeroplane Squadrons

106. The distribution of the squadrons is a matter for the consideration of the War Office, but the Sub-Committee desire to point out that it would be advantageous to station one squadron at Salisbury Plain, within easy reach of the Central School, and one at Aldershot, near the Aircraft Factory.

Personnel

107. *Officers* – See paragraph 27.

108. NCOs and air mechanics[††] will be required as engine drivers, fitters, carpenters, smiths, sailmakers, riggers, &c. Selected NCOs and air mechanics should also be trained as fliers. To provide this personnel, it will probably be necessary to rely largely on direct enlistment, except, perhaps, as regards fliers.

Seconding and Enlistment

109. Although the period of enlistment recommended is four years, it is to be noted that the Sub-Committee are not in a position to recommend a definite period of subsequent Reserve Service. On completion of the period of continuous service re-engagement should be allowed from year to year, or transfer to the Reserve of the Flying Corps on the recommendation of the Commanding Officer of the Military Wing, or of the Commandant of the Central Flying School.

110. Commissioned officers joining the Flying Corps should be seconded and other ranks transferred.

111. Men wishing to enlist into the Corps for non-flying duties should be finally approved by the officer commanding the Military Wing, or the Commandant of the Central Flying School.

Aeroplanes

112. The total number of aeroplanes required for the seven squadrons of the military division will be eighty-four. The completion of these squadrons, however, and the training of fliers for them at the Central Flying school must occupy some considerable time.

113. In an interim report dated the 6th January, 1912 (CID Paper AN 10), which has received the approval of the prime Minister, the Standing Sub-Committee of the Committee of Imperial Defence have recommended that Treasury sanction should be given to the War Officer for the purchase forthwith of twenty aeroplanes and twenty sheds, at an estimated total cost of 28,000l. The types of aeroplane which the Sub-Committee recommend are as follows:

1 Nieuport monoplane, 100 hp, 3 seater.
1 Nieuport monoplane, 70 hp, 2 seater.

[††] The term "air mechanic" is applied to denote men of the Flying Corps below the rank of petty officer or sergeant.

1 Deperdussin monoplane, 100 hp, 3 seater.
1 Deperdussin monoplane, 70 hp, 2 seater.
2 Flanders monoplanes, 2 seater.
2 Bréguet biplanes, 100 hp, 3 seater.
2 Bréguet biplanes, 80 hp, 2 seater.
2 H Farman biplanes, 70 hp (or more), 3 seater.
1 "B" Type, Aircraft Factory, to be made by the factory.
3 "B" Type, Aircraft Factory, to be made by the British and Colonial Aeroplane Company.
1 Cody Biplane, 120 hp.
1 Martin-Handasyde, 60 hp, 2 seater.
2 Blériot monoplanes, 50 hp, single seater.

The orders for most of these have been issued. Further orders will be issued during the course of the year 1912.

Sheds

114. A shed of a portable type, suitable for service in the field, should be at once provided for each aeroplane as it is ordered. Permanent sheds should be provided at the head-quarters of squadrons, when the locations have been fixed.

The Use of Airships for Military Purposes

115. The Sub-Committee have given careful consideration to the question of whether airships should still be used for military purposes. They have had the advantage of hearing the evidence of Major Sir A Bannerman, Bart, the Commandant of the Army Air Battalion, on the subject of airships, balloons, and kites.

116. The airship possesses the great advantage over the aeroplane in military warfare of being able to receive messages by wireless telegraphy; it is also able to transmit to greater distances.

117. France and Germany can establish permanent sheds or shelters at convenient intervals throughout the country, where their airships can seek refuge in bad weather, and they are therefore able to make better use of dirigibles than this country, whose Expeditionary Force is more likely to be employed oversea. It is hoped, however, that means will be found for overcoming our difficulties in this respect, and experiments in this direction are now being conducted, which give prospects of success.

118. On a general review of the foregoing considerations the Sub-committee are of opinion that any immediate extension of the existing equipment of airships is unnecessary so far as the requirements of the Expeditionary Force are concerned, and, as stated in paragraph 89, this report does not deal with military requirements other than those of the Expeditionary Force. Having regard, however, to the persistence of all the great continental nations in experiments with this type of aircraft, they think it would be undesirable for the Army to abandon entirely the use of airships, more especially in view of their recommendation (in paragraph 88) that the naval experiments should cease.

119. They recommend, therefore, that the present Airship Company, furnishing two airships, together with the kite equipment, should be retained, and should become an eighth squadron of the Flying Corps, as recommended in paragraph 93.

Captive and Free Balloons and Kites

120. A Sub-Committee of the Committee of Imperial Defence, which considered the whole question of aerial navigation in 1909, and took a considerable amount of evidence, reported as follows with regard to balloons:

> "Captive balloons have for many years formed part of the regular equipment of all modern armies. The principal uses for which they can be employed in land warfare are reconnaissance and observation of artillery fire.
>
> "It has been pointed out, however, that their value for reconnaissance purposes is limited by the fact that troops on the reverse slopes of hills of moderate elevation and steepness are entirely concealed from the view of observers in captive balloons, unless they rise to a great height; and in the latter case their view will frequently be obstructed by clouds. In hilly country, therefore, their value is small, though in flat country their usefulness has been proved.
>
> "The advantages claimed for balloons in the observation of artillery fire are somewhat uncertain.
>
> "In this connection the evidence showed that the balloon equipment required a somewhat bulky transport, and it seems very doubtful, therefore, whether it would be practicable to attach them to more than a very few of the heavy batteries".

121. The recommendation of the Sub-Committee was as follows:

> "As soon as satisfactory results have been obtained with dirigible balloons the expenditure on captive balloons should cease".

122. With regard to kites the Sub-Committee referred to above reported that:

> "Kites are employed for military purposes as a complement to captive balloons, insomuch as they can only ascend in windy weather, when captive balloons cannot do so. Their functions are identical with those of captive balloons".

123. The information before the Sub-Committee differs in no way from the above. Emphasis has been laid, however, on the value of free balloons as a means of training flying men in finding their way. Airships are also useful for this purpose, and apart from their possible value in war, the Sub-Committee consider that either airships or balloons, if available, would be of assistance in the training of the Flying corps in peace.

124. Kites form at present the only means of aerial observation in high winds. The Sub-Committee recommend, therefore, that two flights of kites shall be included in the Airship Squadron of the Flying Corps.

Transport

125. The Sub-Committee recommend that Transport, as laid down in the War Establishments given in Schedule B, should be purchased for each flight on its establishment.

PART VI

THE AIRCRAFT FACTORY

Functions

126. The Sub-Committee recommend that the existing Army Aircraft Factory should be renamed the "Aircraft Factory", and should be administered by the War Office. It should carry out the following functions:

(1) The higher training of mechanics for the Flying Corps.

(2) Repairs and reconstruction for the Flying Corps.

(3) Tests with British and foreign engines and aeroplanes.

(4) Experimental work.

(5) The existing work in the manufacture of hydrogen, and generally meeting the requirements of the Airship and Kite Squadron.

(6) General maintenance of the factory as at present.

The Chairman, accompanied by certain members of the Technical Sub-Committee, visited the Aircraft Factory, and they satisfied themselves that it is suitable for the performance of these functions.

British and Foreign Engines

127. The Sub-Committee consider it important that this country should keep abreast of all practical developments in the aeroplane industry in all parts of the world. At the present time the primary need of this industry is the perfection of an entirely satisfactory engine. There are at the present time a number of aeroplane engines in the market, which are believed to have given satisfactory results. It is extremely difficult, however, especially in the case of foreign engines, to obtain reliable information regarding them without purchasing power. Experience has shown that the foreign engine manufacturer attaches but little importance to the prospect of business in this country, and when approached either personally or by letter, is prone to be suspicious of a desire on our part to learn by his experience.

128. The makers of engines whom it is desired to approach are as follows:

Anzani.	Viale.
Burlat.	Austro-Daimler.
Chenu.	Mercedes.
Dansette-Gillett.	NEC.
Gnome.	ABC.
Panhard.	Wolseley.
Renault.	Green.
Salmson (Canton Unné).	

129. The Sub-Committee recommend, therefore, that a sum of £3,500 should be granted to the Aircraft Factory for the purchase of engines, subject to the satisfactory fulfilment of a series of tests to be conducted at the Aircraft Factory, in horse-power, endurance, weight, fuel, and oil.

The Aerodrome, South Farnborough

130. The Sub-Committee are of opinion that certain improvements are required in the aerodrome, South Farnborough.

131. At present there is one good flying ground at Cove Common, where the Aircraft Factory is situated, and another on Laffan's Plain, and to make it possible to alight anywhere between these areas a passage has been cleared. It is very desirable, however, that another passage should be cleared in order to bring the area at Ball Hill into communication with the other two and to allow of a circular flight over the combined areas.

132. The Sub-Committee therefore recommend that a passage should be cleared as soon as possible from Laffan's Plain to the Aircraft Factory via Ball Hill. These alterations would greatly increase the value of this aerodrome.

133. Further improvements which could be effected here would be the clearing of a passage from Laffan's Plain to Fleet Pond.

PART VII

PAY AND ALLOWANCES OF THE FLYING CORPS

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PART VIII

MISCELLANEOUS

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FINAL OBSERVATIONS

180. In presenting the foregoing recommendations the Sub-Committee desire to lay stress on the tentative nature of the scheme. In formulating an entirely new scheme for the creation of a new arm of the service, in every phase of which novel difficulties have to be surmounted, it is inevitable that omissions and mistakes should occur. To deal with unforeseen contingencies and ever changing conditions, as the art of flying progresses, the Sub-Committee consider the formation of the Air Committee as a permanent Sub-Committee of the Committee of Imperial Defence, as suggested in paragraph 21, to be a matter of the first importance.

181. The first step, on which everything else depends, is to get our flying men trained and machines for them to fly in. The foregoing proposals will provide at once some fifty-five additional aeroplanes, two hydro-aeroplanes, and in the near future sixty-four more aeroplanes and twelve more hydro-aeroplanes, and the Sub-Committee submit that every possible effort should be made to provide them with efficient crews at the earliest possible date.

(Signed) J E B SEELY (*Chairman*).
G K SCOTT MONCRIEFF, Brigadier-General.
DAVID HENDERSON, Brigadier-General.
C R SAMSON, Commander, RN.
R GREGORY, Lieutenant, RN.
MERVYN O' GORMAN.

C L OTTLEY (*Secretary*)
M P A HANKEY (*Assistant Secretary*)

2, Whitehall Gardens, SW
February 27, 1912.

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